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**Elenka Brenna and Cinzia
Di Novi**

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Is caring for elderly parents detrimental for women's mental health? The influence of the European North-South gradient

Elenka Brenna

Cattolica del Sacro Cuore, Dipartimento di Economia e Finanza

Cinzia Di Novi

Università Ca' Foscari, Dipartimento di Economia

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Abstract: In the last decades, both the lengthening of life expectancy and an accentuated decline in birth rates have reduced the consistency of the younger generational cohorts. Due to an ageing population, the burden of care giving is expected to intensify in the next quarter of the century in Europe, especially for mature women. This paper investigates the impact of the provision of constant care for elderly parents on the mental health of adult daughters, between the ages of 50 and 65, living in different European countries. Data is collected from the Survey of Health, Ageing and Retirement in Europe (SHARE). Information on mental health status is provided by Euro-D depression scale, a standardized measure of depression employed across European countries. We focus on differences in the effects according to a North-South gradient: we test whether the relationship between informal caregiving and mental health differs across European macro- regions. Our results reveal the presence of a North-South gradient in the effect of caring on women's mental health.

Key words: caregiver burden, depression, parent care, LTC systems, mature women.

JEL Classification code: I10; I12; D10

Address for correspondence:

Cinzia Di Novi

Department of Economics
Ca' Foscari University of Venice
Cannaregio 873, Fondamenta S. Giobbe
30121 Venezia - Italy
Phone: (+39) 041 2349155
e-mail: cinzia.dinovi@unive.it

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Department of Economics
Ca' Foscari University of Venice
Cannaregio 873, Fondamenta San Giobbe
30121 Venice Italy
Fax: ++39 041 2349210

1. Introduction

Over the last few decades, the simultaneous decrease in mortality and fertility rates has induced a progressive ageing of the European population. Declining birth-rates have reduced the consistency of the cohorts of young generations, while growing life expectancy has caused the age in which people die to rise. The percentage of people over sixty-five is higher in Europe than in any other continent and the ageing phenomenon is a problem that will make itself felt for the rest of the century. Forecasts for European demographics in the year 2060 are worrisome: about half the population of the EU-27 countries will be over fifty, while over-65-year-olds will increase from the current value of 17.4% to 30% (Eurostat, 2010).

The ageing of the population and the greater longevity of individuals will lead to increasing numbers of older persons in need of long-term care. This need is partly met by formal supply of care (e.g. medical doctors, nurses) either in purpose built structures (e.g. hospitals, nursing homes) or in homes for the elderly; frequently, however, eldercare is provided by informal caregivers, typically women, who devote part of their time to assisting their needy relative and who, in the collective view, are regarded as better suited to taking on home and family responsibilities (Davey and Patsios, 1999; Mortensen *et al.*, 2004; Carrieri *et al.*, 2012; Di Novi *et al.*, 2013). This is especially the case in the Southern European countries, commonly referred to as “strong family-ties countries” in contrast to the “weak family-ties countries” of Northern Europe. Mediterranean societies have traditionally been based on family unity and on an intra-generational pact of reciprocity, due both to cultural background and inadequacies in the institutional settings, two factors that are strictly related each other. (Reher, 1998; Billari, 2004; EOP 2010).

The aim of this study is to estimate the impact of constant caring for elderly parents (biological parents, parents in law and step-parents) on the self-assessed mental health of women between the ages of 50 and 65, living in different European countries. The possible effect of the provision of informal care on daughters’ mental health status is measured by the EURO-D scale, a symptom-oriented instrument measuring depression. The empirical investigation is performed using a representative sample drawn from the SHARE (Survey of Health, Ageing and Retirement in Europe) survey. Specifically, we used data from the second wave of SHARE which were collected through personal interviews between the end of 2006 and the summer of 2007; we also included lagged information from the first wave of the same survey, collected in 2004.

Our paper contributes to previous literature by exploring the relationship between informal care giving and mental health according to a North–South gradient. In order to shed light on the factors associated with the North-South gradient in Europe, which may influence the impact of caregiving on women's mental health, we draw three different samples, each belonging to a European macro region: Northern, Central and Southern Europe. Apart from cultural and social factors, this subdivision also reflects three care regime clusters which differ for: i) the amount of resources destined by each country to Long Term Care (LTC), ii) the role of informal care and iii) the different eldercare policies across European countries considered in the sample.

In order to account for potential endogeneity due to self-selection and reverse causality in the relationship between the provision of informal care and the informal caregivers' mental health, we matched each informal caregiver with a non-caregiver on each characteristic known to be associated with a caregiver's condition and mental health (Caliendo & Kopeinig, 2005). In our analysis we performed this matching by using propensity score, as formalized by Rosenbaum and Rubin (1983). Perceived mental health of matched individuals was then compared to estimate the average effect of being an informal caregiver.

Our results reveal a clear and robust North-South gradient: the provision of informal care has a negative and significant impact on daughters' mental health in the Mediterranean countries only, where informal care is still the main source of LTC support services. These findings may be interesting from a policy standpoint, inasmuch the health effect and time burden of caregiving translate into larger wealth effects, which may include higher health expenses for the caregivers, early retirement or job interruption (Coe and Van Houtven, 2009).

The remainder of the paper is organized as follows: Section 2 presents a review of the literature on caregiving and mental health, Section 3 describes the data and the structure of the Northern, Continental and Southern sub-samples. Section 4 illustrates the empirical model, while the results are presented and debated in Section 5. Concluding remarks are reported in Section 6. The Appendix includes figures and tables along with the variables' definitions and the empirical results.

2. Caregiving and the effects on mental health

Extensive literature exists on the association between physical and psychological health and being a caregiver (Shulz and Beach, 1999; Vitaliano, 2003; Reinhard *et al.*, 2008, Shulz and Sherwood, 2008). According to most definitions (Rubin and White-Mean, 2009; OECD, 2011; Bonsang, 2009; Bolin *et al.* 2008a,b), informal eldercare encompasses personal care, practical housework and paperwork duties. Reasonably, providing elderly parents with informal care over extended periods of time may cause stress and burnout with detrimental consequences for the occupational and social spheres (Pavalco and Artis, 1997; Crespo and Mira, 2010). Adult children are often torn between the responsibility to a parent and to their own careers and families, a dilemma that can result in detrimental effects on mental health (Coe, Van Houtven, 2009). Generally, it turns out that being an adult child caregiver increases the probability of suffering from episodes of depression (Amirkhanyan and Wolf, 2006), especially if the parent-child relationship is not a particularly close one (Lin *et al.*, 2012). Studies concentrating on the psychological health of women, who are normally more involved with the commitment of providing care, trace a direct relationship between caring for parents and depression levels among daughters (Silverstein *et al.*, 2006; Bookwala, 2009). Within the OECD countries, caregivers who devote over twenty hours a week to looking after their family members are 20% more likely than non-caregivers to suffer from mental disturbances and the percentage is even higher for carers living in Southern Europe (OECD, 2011). The probability of experiencing mental problems is associated to the number of eldercare weekly hours, 20 hours being the threshold. Caring with lower intensity (either less than 10 hours/week or between 10 and 20 hours/week) does not always lead to a higher prevalence of mental health problems among carers. Coe and Van Houtven (2009), who investigated the health consequences on the adult child caregivers providing constant care to an elderly mother, highlighted an association between constant caregiving and depressive symptoms for both married men and women, with persistent effects (at least two years after stopping caregiving) for the latter. No impact on depression index was found for single daughters, which suggests that more investigation is required on this category of adult child carers. El Habhoubi (2012) used SHARE data (citizens over 50 and less than 65) to study the effect of caring on both employment and mental health. With regard to the second issue, for either men and women, being a caregiver increases the probability of being depressed, but the effect of

providing care on mental health is higher for women. Not surprisingly, differences in the results were shown according to the intensity and kind of care provided.

While the relationship between being a caregiver and the risks of suffering from mental health disturbances is well established and deeply assessed by the literature, the issue of the detrimental effects on the carers according to a geographical gradient across Europe requires more consideration. We contribute a new strand to the literature, by exploring the association between informal caregiving and mental health according to a North South gradient.

3. Data

The Survey of Health, Ageing and Retirement in Europe (SHARE), co-ordinated by the Mannheim Research Institute for the Economics of Aging (MEA), is the most ample and complete European study about ageing. SHARE is subdivided into 22 modules (each one identified by two letters) dedicated to collecting detailed information on a wide variety of aspects, among which the health status, the socio-economic characteristics and the family relationships of people aged 50+ in Europe.^{1,2} The design is based on the Health and Retirement Study (HRS) and the English Longitudinal Study of Ageing (Borsh- Supan and Jorges, 2005).

The survey information for waves 1 and 2 of SHARE were collected in 2004 and between the end of 2006 and the summer of 2007 respectively, through Computer-Assisted Personal Interviews (CAPI) supplemented by a self-completion paper. The interviews were carried out in eleven European countries in 2004 and in fourteen in 2006. The states fell within three macro areas: Northern Europe (Denmark and Sweden), Central Europe (Austria, France, Germany, Switzerland, Belgium and the Netherlands), and Southern Europe (Spain, Greece and Italy), with the addition, from 2006, of two East European countries (Poland and the Czech Republic) and Ireland.

¹The target population of SHARE is defined both in terms of households and in terms of individuals. The interviewers observed the family with at least one person and the individual born before 1954 who speaks the official language of the country and who, during the time of the survey, does not live abroad or in an institution like a prison, as well as their spouse/partner independent of age.

²An important disadvantage of using SHARE data is that people in nursing homes and residential care are not included in the survey.

Our analysis is mainly based on version 2.5.0 of SHARE's second wave (2006-2007) and includes lagged information from the first wave of the same survey. In order to take advantage of lagged information from wave 1, Poland, the Czech Republic and Ireland were not included in the data set as they were only present from the second wave. The target population of our study is women between the ages of 50 and 65 with at least one living parent at the time of the first wave. Women in this age range are most likely to be involved in the care of their elderly parents (Crespo and Mira, 2010).

Following Rubin and White-Mean (2009), we define "caregivers" as women providing informal assistance to their elderly parents. By assistance, we mean personal care (e.g. dressing, bathing or showering, eating, getting in or out of bed, and using the toilet), practical household help (e.g. home repairs, gardening, transportation, shopping, and household chores), and help with paperwork (e.g. filling out forms, and settling financial or legal matters).

In defining caregiver we also apply a threshold. SHARE allows one to distinguish between women who provide assistance to elderly parents living in the same household (3.45% of the sample), for whom it is assumed that informal care is provided on a daily basis, and women who provide assistance to parents living separately from them. With regard to the latter, SHARE provides information on the frequency with which care is provided: daily, every week, at least once a month, or just occasionally. In order to avoid including occasional assistance, we excluded from the sample women who do not at least provide care on a weekly basis.

3.1 The Northern, Central and Southern sub-samples

The sample, which includes 4430 observations, was stratified into three macro-regions, namely Northern (with 1159 observations - 26% of the sample), Central (with 1498 observations - 34% of the sample) and Southern Europe (with 1773 observations - 40% of the sample) according to i) the amount of resources destined by each country to Long Term Care; ii) the role of informal care; and iii) the different eldercare policies across European countries considered in the sample.³ The clusters differ from the original

³ Literature suggests different ways of classifying European countries according to the reported characteristics. Consistently with the data availability, we adopted a care regime cluster approach that falls midway between the traditional Esping-Anderson approach (1990) and the countries classification carried out by Bettio and Plantega (2004). Our clustering approach was also adopted by Crespo and Mira (2010) who used SHARE data.

SHARE classification for the inclusion of the Netherlands within the Northern countries, henceforth the final classification is the following: North of Europe (Denmark, Sweden and the Netherlands), Central Europe (Austria Belgium, France, Germany and Switzerland) and South of Europe (Italy, Spain and Greece).

Northern countries, such as Denmark, Sweden and the Netherlands are characterised by generous and universal LTC systems: they spend respectively 2.5%, 3.7% and 3.8% of their GDP on LTC (see Figure 1). At the opposite side, among Southern countries, Spain spends 0.65% of its GDP.⁴ In between, Continental countries show a quite heterogeneous picture: the level of public expenditure on LTC as a percentage of GDP ranges from 1.9% in Belgium to 0.9% in Switzerland.

Financial heterogeneity across Europe depends on different weights assigned to LTC policies by each country. While in the North of Europe the welfare state is based on the social rights recognised to every citizen, in the Mediterranean countries LTC services are provided only where a social network is absent and the financial means of the person are not sufficient to pay for private arrangements (EOP, 2010). These different policies are deeply rooted in cultural and historical factors that characterise the role of the family across Europe and that consequently influence the provision of informal care to the elderly in the three macro-regions (Riedel and Kraus, 2011). Literature suggests two different and geographically polarised family models across Europe, addressed as “strong-family-ties” for the South of Europe and “weak-family-ties” for the North of Europe (Reher, 1998; Billari, 2004; Bolin *et al.*, 2008b; Kotsadam, 2011). According to this vision, in the Northern countries adult children are not even legally responsible⁵ for caring for their parents and the ageing population’s needs are mainly delegated to the public sector, either through the direct delivery of services, or with a financial provision for those informal carers (relatives, neighbours and friends) who decide to provide intensive care to the frail elderly (Crespo and Mira, 2010; EOP, 2010). In the latter case, and under specific conditions - such as isolation and very low socio-economic status of the recipient - the carer’s activity, after an adequate training provided by qualified personnel, is considered and remunerated as a proper job.⁶ Continental countries fall in the middle: during the

⁴ Data for Italy and Greece LTC expenditure were missing since they are not included in the OECD data we used (see figure 1).

⁵ In Sweden for example the children’s legal obligation to care for their parents has been abolished. The municipality is solely responsible for elderly assistance (EOP, 2010).

⁶ The issue of informal caregivers’ training is very important and well debated. Southern countries in particular lack these kind of services, with the consequence that, without receiving any preparation on this topic, the carers often feel inadequate in coping with elderly personal care.

nineties, countries with social health insurance such as Austria and Germany, implemented new policies to cover elderly needs: respite care, for instance, essential to limit overburdening for informal caregivers, has become part of the benefit package in Austria and Germany and the extent of this benefit has recently increased considerably in Germany. Still, compared to Scandinavian countries, public services cover a minor share of the ageing population's needs, but financial contributions are provided to the elderly in need of care (Sarasa and Mestres, 2005; EOP, 2010). Conversely, all the Mediterranean countries are based on family centred models of welfare, with few institutional services and very little help to the informal caregivers. Informal care to the elderly is still and almost totally provided by families (see figures 2 and 3), especially by the adult daughters, who are left alone to cope with critical situations arising from the old person's conditions (Crespo and Mira, 2010; EOP, 2010). Figure 2, based on data from the first wave of SHARE, shows the distribution of formal and informal care received by respondents aged 80+ assisted regularly (daily or weekly basis) across the three geographical macro areas. A strong gradient North-South is shown: while in the Northern countries more than 80% respondents receive formal care, this percentage is 70% for continental countries and becomes less than 30% for the South of Europe. For the Mediterranean countries the scarcity of institutional answers is solved employing informal care, which is generally provided by a family member. Our hypothesis is that, in the North of Europe, providing informal care does not require the same physical and psychological burden held by the caregivers in the South of Europe, which, beyond devoting time to assist their relatives, are required to manage every aspect of their health assistance, with very little institutional help. Mediterranean mature women are expected to be the ones who pay more for the institutional gap in their residence countries, with possible effects on their mental health.

4. Estimation Strategy

Identifying a causal association between informal care and individuals' mental health status may be complicated by the presence of endogeneity due to self-selection and potential reverse causality in the relationship between the provision of informal care and informal caregivers' mental health. Panel data are useful to disentangle the problem of reverse causality but the selection problem still remains difficult to solve. The treatment assignments may not be randomized and outcomes may be biased by differences in the

characteristics which influence the selection into informal caregiver status. One method of adjusting an analysis of treatment outcomes for the effects of confounding covariates is to perform propensity score matching, as formalized by Rosenbaum and Rubin (1983).

The propensity score matching technique produces two balanced groups, one of caregivers and one of non-caregivers: the score substitutes a collection of confounding variables with a single covariate that is a function of all the variables. By summarising the intrinsic characteristics that could generate distortions, propensity scores use a matching procedure to allow for comparisons between the treated and control groups.

First of all the method calculates the probability of providing informal care. The values of the parameters for the probability of providing informal care, calculated with a probit model, are transformed into a score that takes into account the observable qualities (age, country of residence, family composition, socioeconomic status, etc.). Such characteristics differentiate the caregivers from those who do not provide care and are associated with the caregiver's condition and individual mental health. The score allows one to select, for each caregiver, a 'twin' individual from among those who do not provide care to the elderly, so as to minimise all the systematic differences that may otherwise affect the mental health of the interviewed women. The 'twins', who do not provide informal care, are those who show the closest possible score to the reference individual providing care to the elderly. Lastly, the average treatment effect on the treated (ATT) is measured by the difference in the self-reported mental health indicator: the hypothesis being that, given two individuals whose observable characteristics are as similar to each other as possible, any differences in their mental health status may be attributed to the effect of providing care to the elderly.

4.1 The Propensity Score Model

To begin with, a probit model was set up on which to base the score: the dependent variable is a binary variable that takes a value of 1 for interviewees who provide care to at least one elderly parent (biological parents, parents in law or step-parents), and 0 otherwise. The independent variables can be grouped in the following categories: demographic variables (age, age squared, country of residence), family composition (marital status, children still living at home), socioeconomic variables (educational level, family income, employment status), information on parents receiving care (health status of

the respondent's mother and father, geographical distance between the daughters and their parents). Moreover, we controlled for respondent's self-reported probability of receiving an inheritance, respondent's mental health status and caregiver status at the first wave.

Age was modelled as a continuous variable. We included country dummies within each macro-region, so as to capture any single country-level differences. Marital status was categorized into "living with a spouse or a partner in the same household" and "living as single". In order to capture additional caregivers' responsibilities other than elderly parents, we included a binary indicator that assigns a value of 1 if at least one of the care provider's children still lives at home.

The International standard classification of education (Isced) was used to classify the education variable. Isced is classified into 7 levels: Isced 0 (pre-primary schooling); Isced 1 (primary education); Isced 2 (lower secondary); Isced 3 (upper secondary); Isced 4 (post high school); Isced 5 (university); Isced 6 (postgraduate). In the analysis Isced levels 0, 1, 2 and 3, 4 and 5, 6 have been grouped together, respectively. Three levels of education were therefore considered: 1) low education (no educational certificates or primary school certificate or lower secondary education); 2) medium education (upper secondary education or high school graduation); 3) high education (university degree or postgraduate). Income information is based on the total annual household income, obtained summing up its different components assessed in the questionnaire. Income was normalized on the family size and log-transformed to obtain a normal distribution. Occupations were categorized into four groups: employed, retired, homemaker and unemployed.

SHARE supplies information on parents receiving care. Concerning the health status of the respondent's mother and father, it is daughters themselves who assess the state of health of their parents, which is inferred via an indicator of psycho-physical good/bad health, measured on an ordinal scale from 1 to 5, where 1 indicates the healthiest state. Given that the 5 positions are not equidistant, a binary "healthy/non-healthy" variable has been set up assigning a value of 0 if the daughter reported in the survey that the elderly parent enjoys "excellent, very good or good" health and a value of 1 if the parent's state of health is "bad or very bad" (O'Donnell O. et al., 2008). As with Bolin et al. (2008a), in the event of death, a value of 1 is assigned to the parent's state of health indicator. We used death occurring in the second interview as a proxy for the poor health of the parents.

SHARE also includes information on the distances between the parental and adult children's homes. We allowed the indicator of distance to take the following categories:

daughters can live either in the same household, in the same building, or less than 1 kilometre away; between 1 and 25 kilometres away; between 25 and 100 kilometres away; more than 100 kilometres away. The distance between child and parental home is a proxy for the provision of child services, since services are more costly to offer when the child lives further from her parent's home (Pezzin and Steinberg-Shone, 1999; Callegaro and Pasini 2008; Bonsang, 2009).

Among the control variables we also included an indicator of strategic behaviour guided by a bequest motive – the chance of inheritance – that has been studied in the literature as a potential determinant of the provision of informal care (Sloan *et al.*, 1997; Sloan *et al.*, 2002). We used the respondent's self-reported probability of receiving an inheritance over the next ten years. Finally, we employed a binary indicator, that assigns a value of 1 if the interviewee suffered from depression in the previous survey and a binary indicator that assigned a value of 1 if the interviewee was an informal care provider during the first survey.

Once the propensity score was calculated, we proceeded with statistical matching so as to form 'twin data' that differ in terms of the caregiver status alone and not in terms of any of the other observed characteristics. Since the sample consists of comparatively few informal caregivers in relation to many untreated ones, Kernel and Radius (with caliper 0.5) matching were chosen as the matching algorithms. These techniques use the maximum amount of data and, in the case of Radius matching, the imposition of a tolerance threshold avoids the risk of bad matches (Caliendo and Kopeinig, 2008; Imbens and Wooldridge, 2008).⁷

4.2 Outcome Variable

Women's mental health was measured in terms of the EURO-D scale. This is a scale for measuring depression that was developed and validated by the EURODEP *Concerted Action Programme*. It consists of 12 elements connected to psychological health: depression, pessimism, wanting to die, guilt complexes, sleeping difficulties, lack of interests, irritability, lack of appetite, fatigue, lack of concentration, inability to take pleasure from normal activities and a tendency to crying. Each item is of equal weighting and reported with a 0 if the symptom is absent and a 1 when it is present. We focussed on

⁷ The estimation was carried out using the PSMATCH2 program for STATA developed by Leuven and Sianesi (2003).

the clinical definition of depression as indicated by the EURO-D scale with a clinically defined cut-off point at four symptoms identifying the respondent as depressed, i.e. having severe mental health problems (Prince *et al.*, 1999).

5. Results

Table 2 shows some summary statistics: it arises that women who take care of their parents show better mental health in the Northern and Central Europe and worse in the South. In Mediterranean countries women who provide informal care to their elderly parents are less likely to be higher educated and employed and are mostly just mothers with dependent children compared to Central and Northern countries. This last aspect is not surprising since in the last decades the medium age of generating the first child is higher in Southern Countries compared to the Northern ones (Billari, 2006).

Table 3 shows the average effect of providing care to the elderly (ATT) as measured on the EURO-D depression indicator⁸. ATT was computed by adopting two matching methods: Kernel and Radius Matching. Only observations within the common support were used in the matching.

The results reveal the presence of a North-South gradient: providing assistance to one's elderly parents appears not to have a significant effect on depression in North and Central Europe, while in the Mediterranean countries it increases the probability of suffering from mental health problem: a South-European caregiver has a 8% higher probability than a non-caregiver of suffering from depression.

It is plausible that positive consequences, such as rewards and satisfaction, may buffer the negative effects of caregiving (Walker et al., 1995). This may happen especially in the Northern and Continental countries where, thanks to a stronger formal care system, a daughter can choose to assist an elderly parent for her own gratification (as opposed to being obliged by necessity). This is particularly true for the less labour intensive domestic help, which can more easily be performed on a voluntary basis. In contrast, intensive care, the provision of which is often determined by the needs of the heavily dependent recipient,

⁸The results for the probit model for the propensity score and the covariate balancing test have not been included, however, they are available on request from the authors. The model described in Section 4 has made it possible to obtain a balanced estimate for the propensity score. The covariate balancing test shows that the matching is effective in removing differences in observable characteristics between formal caregivers and daughters who do not provide care to elderly parents. In particular, the median absolute bias is reduced by approximately 40%-62% depending on the macro area and the matching technique. The Pseudo R-squared after matching is always close to zero, correctly suggesting that the covariates have no explanatory power in the matched samples.

requires a balance between caregiving and other activities, such as child-care, leisure and work. Women who provide constant intensive care to elderly parents may find it more difficult to focus on the positive aspects of caregiving: even though women are less career-oriented and place a higher value on non-market activities such as family responsibilities (Carrieri et al., 2012; Booth et al. 2002) they might feel themselves seriously impaired if they become inactive because of their care-giving duties (Saras and Mestres, 2005). Therefore it is important to consider these aspects when analyzing the impact of caregiving on women's mental health.

SHARE provides the possibility of distinguishing between domestic chores and more labour intensive personal care (such as bathing, body care, dressing). We used this information to further investigate the potential impact that constant intensive care may have on the self-assessed mental health of carers. Hence, we re-estimated our model by excluding from the sample women who help elderly parents with domestic chores only (14% of the sample). We computed the propensity score through a probit model for those who provide personal care to elderly parents, using the same specification as described in section 5.⁹ The sample included 3936 observations. Among the caregivers (16% of the sample), the number of women who provide intensive care to elderly increases moving southwards: 38% of informal carers in the North of Europe provide intensive care to their parents, 40% in the Continental Europe and 57% for the Mediterranean area.

Table 4 shows the ATT for women who provided intensive care to their parents for each macro-area: as before, intensive informal care seems to have an adverse influence on psychological well-being of South-European caregivers but now the ATT is higher (a caregiver has a 10% higher probability of a non-caregivers of assessing her own mental health as bad) and more significant. Actually, in Northern and Central Europe the ATT is not statistically different from zero. These figures mean that a North or a Central European caregiver who provides intensive eldercare has no higher probability than a non-caregiver of suffering from depression.

According to the previous literature (Billari, 2004; Bolin *et al.*, 2008b, Crespo and Mira, 2010; Kotsadam, 2011) the geographic factor seems to play an important role: the result is influenced by the social/cultural norms which characterize each area but also by the degree of provision of formal care to the elderly. In all the countries of the sample, intergenerational solidarity pushes daughters to provide care to their elderly parents,

⁹All observed controls used in the propensity score matching analysis satisfy the balancing property again.

however, South European countries are penalised by serious shortcomings in organisational and structural assistance for elderly citizens. In this macro area, caregivers face all the complexities of organizing a care programme for their parents: they often lack both the adequate preparation to provide care and the guidance from the formal health care provider. As a consequence they are weighed down with much more responsibility leading to an excessive degree of emotional strain.

5.1 Robustness and Sensitivity Check

We tried a different specification of the propensity score model in order to check to what extent our ATTs were sensitive to the observable variables chosen. For instance, it might be argued that employment status may not be a good pre-treatment variable since it may be determined, in turn, by the informal caregiver status. In our model, we include employment status since it is not only a good proxy of the opportunity cost of care (which may influence the probability of being a caregiver) but it may be also a distraction from the burden of assistance and hence may positively influence women's psychological health. Barnett, *et al.* (1992), for instance, reported that employed women generally exhibit better mental health than non-employed women do. There is some empirical evidence that employed elder caregivers experience lower levels of depressive symptoms than non-employed caregivers do (Rosenthal *et al.* 1993; Cannuscio *et al.*, 2004) Our results are not driven by the inclusion of this variable because, when excluding employment status from the probit model, the ATT remain substantially unchanged.

As a further check, we re-run the model by using as dependent variable in the probit model a different proxy of intensive/constant care. We employed the number of weekly hours dedicated to eldercare. During the survey, the respondent was asked to give an estimate of the number of hours of informal care given on a typical day or week. Following Bolin *et al.* (2008a) we created a variable indicating for each respondent the total number of hours per week that she devoted to informal care. If the respondent gave informal care on a daily basis, we multiplied the number of hours provided on a typical day by 7. If the respondent provided assistance to parents almost every week, the number of hours was kept as it was. Then, according to the existing literature, we defined 20 hours as threshold of care intensity (OECD, 2011). We excluded from the sample those who reported to have provided care to an elderly parent living in the same household (3.45% of the full sample as reported in the Section 3), since no information on hours of care is reported in this case.

Moreover, we excluded those who provided less than 20 hours of informal care (17% of the full sample). The new sample included 3354 observations: only 7.3% of the respondents provides more than 20 hours of care to the parents, and they are mainly concentrated in the South of Europe (57% of the caregivers against 15% of the North and 12% of the Continental Europe). Table 5 shows that the results are consistent with those obtained from the model using personal care as proxy of intensive care (see Table 4). The ATT of intensive caregiving, expressed as more than 20 hours per week of informal care, is still positive and significant at the 5 percent level for the Southern macro-region. The fact that the two estimates are very similar is evidence of their robustness.

6. Conclusions

Our paper contributes to the previous literature by exploring the relationship between informal caregiving and mental health according to a North–South gradient. Overall, our results show that the provision of care to parents in Europe impacts on the daughters' mental health status along with their geographical location. Actually, caring significantly deteriorates women's mental health only in the countries belonging to the South macro area where the amount of resources allocated to finance LTC is minimal and the local system of health and social services for the elderly lacks the necessary structures to meet the increasing demand for elderly care services. In the Mediterranean area, it is the family that historically has shouldered the burden of looking after its elderly parents, both financially and in terms of assistance. Similarly, it is still the family that supports the new generations facing the lack of job opportunities, even if these generations have already left the family nucleus, in a reciprocal pact that reflects the structural absence of institutional answers.

In contrast, North European countries, with Sweden in the lead, have for several decades addressed the problem of their elderly and, through a series of reforms, found legal solutions to protect them. State and municipalities are by law responsible for the elderly's care and assistance: under these circumstances, a daughter's choice to assist her parents does not represent a stressful experience, which may explain why we didn't find evidence of detrimental consequences on mental health of eldercares in this macro-region. The same considerations could be addressed to the Central geographical area. Continental countries present a more heterogeneous and less developed framework of welfare regimes compared

to the Northern ones, though, during the nineties, their Governments tackled the problem of elderly care with different measures. Again, no evidence exists of a negative impact on the daughters' mental health. The attention of policymakers is henceforth to be focused on the Mediterranean countries, where the issue on eldercare policies has yet to be addressed. Informal carers, in this case the adult daughters, are left entirely on their own when it comes to supporting their elderly parents and this implies a higher level of stress in their daily activities. As a consequence they present a higher probability than non-carers to be affected by mental health problems. Policies responses for the Southern countries may be diverse, depending on different variables affecting each single government approach to elderly care. As some authors suggest, a gradual substitution of formal to informal care may help in avoiding burnout risks for Mediterranean women. This change, in the long run, does not necessarily induce a welfare loss (Balía and Brau, 2013). To this extent, a potential basin of formal care could be found in the work supply provided by citizens coming from countries outside the EU, which in the last decades have been increasingly populating the Southern macro-regions. Besides, the option of offering care through nursing homes, with financial support for the poorest, may be considered for the frailer elderly. In view of the already urgent problem of demographic ageing, which is inevitably destined to become more pronounced in the near future, a combination of these policies or other possible selected measures, should be carefully examined and delivered, to progressively face the issue of elderly care in the Southern European countries.

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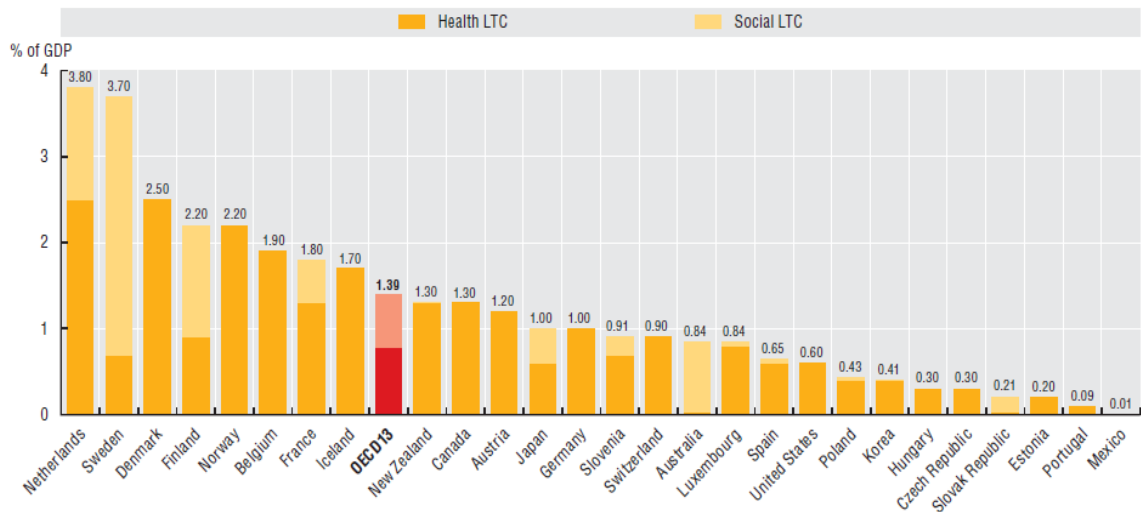
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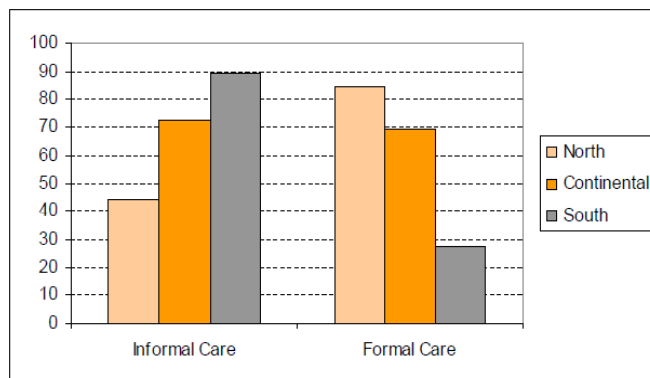
APPENDIX

Figure 1: LTC in OECD countries (as % of GDP), 2009 data or last available year



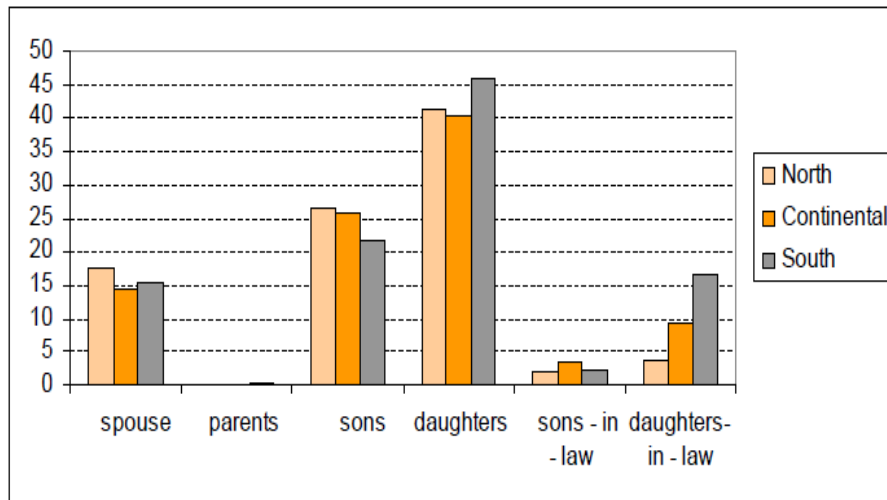
Source: OECD, 2011

Figure 2: Prevalence of informal and formal care among respondents aged 80 and over who receive care on a daily or weekly basis (% , SHARE 2004)



Source: SHARE

Figure 3: The importance of different relatives as informal caregivers of people aged 80 and over who receive informal care on a daily or weekly basis (% , SHARE 2004)



Source: SHARE

Table 1. Variable Description

Name of the Variable	Definition of the Variable
Dependent Variables	
EURO-D	Scale measuring depression
Controls	
Age	Age in years
Education	
Low education	1 if low educated, 0 otherwise
Medium education	1 if medium educated, 0 otherwise
High education	1 if highly educated, 0 otherwise
Family Composition and Marital Status	
Children living at home	1 if at least one child still lives at home, otherwise 0.
single	1 if single, otherwise 0
Married or living with partner	1 if she lives with a husband or partner, otherwise 0
Employment and Income	
Employed	1 if employed, 0 otherwise
Unemployed	1 if unemployed, 0 otherwise
Retired	1 if retired, 0 otherwise
Homemaker	1 if homemaker, 0 otherwise
Income	Annual family income (in Euros)
Information on parents receiving care	
Parents health status	1 if at least a parent suffers from bad health, 0 otherwise
less than 1 kilometre	1 if parents live less than 1 km from children's homes , 0 otherwise
between 1 and 25 kilometres	1 if parents live between 1 and 25 km from children's homes , 0 otherwise
between 25 and 100 kilometres	1 if parents live between 25 and 100 km from children's homes , 0 otherwise
more than 100 kilometres	1 if parents live more than 100 km from children's homes , 0 otherwise
Inheritance	
Inheritance	respondent's self-reported probability of receiving an inheritance
Depression at the 1st wave	
Wave 1 depression	1 if depressed during the first survey, otherwise 0

Informal Care Status at the 1st wave

informal caregiver wave 1

1 if caregiver during the first survey, otherwise 0

Table 2. Summary Statistics

Table 2a. Northern Europe

Variable	Full Sample		Informal Care		No Informal Care	
	<i>Mean</i>	<i>Std. Dev.</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Mean</i>	<i>Std. Dev.</i>
<i>Dependent Variable</i>						
depression at II wave	0.141	0.348	0.096	0.294	0.157	0.364
<i>Independent Variable</i>						
age	58.090	5.044	58.647	5.128	57.883	5.000
Denmark	0.161	0.368	0.207	0.406	0.144	0.352
Sweden	0.468	0.499	0.411	0.493	0.489	0.500
The Netherlands	0.371	0.483	0.382	0.487	0.367	0.482
single	0.179	0.384	0.207	0.406	0.169	0.375
children still living at home	0.068	0.252	0.080	0.271	0.064	0.245
low education	0.338	0.473	0.303	0.460	0.351	0.478
medium education	1.000	0.000	0.366	0.483	0.270	0.444
high education	0.366	0.482	0.331	0.471	0.379	0.485
income	43912.91	29312.88	52360.900	39086.750	39890.060	22235.590
retired	0.178	0.382	0.191	0.394	0.173	0.378
employed	0.693	0.462	0.713	0.453	0.685	0.465
unemployed	0.017	0.130	0.000	0.000	0.024	0.152
home_maker	0.112	0.316	0.096	0.294	0.118	0.323
parental health	0.799	0.401	0.761	0.427	0.813	0.390
< 1 km away from parent's home	0.142	0.349	0.268	0.443	0.095	0.293
between 1 and 25 km away from parent's home	0.399	0.490	0.557	0.497	0.340	0.474
between 25 and 100 km away from parent's home	0.194	0.396	0.096	0.294	0.231	0.422
>100 km away from parent's home	0.274	0.446	0.080	0.271	0.347	0.476
chance of inheritance >50%	46.316	41.861	52.787	41.447	43.911	41.784
depression at I wave	0.172	0.377	0.159	0.366	0.176	0.381
caregiver at I wave	0.404	0.491	0.777	0.417	0.265	0.442
N	1159		314		845	

Table 2b. Continental Europe

Variable	Full Sample		Informal Care		No Informal Care	
	<i>Mean</i>	<i>Std. Dev.</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Mean</i>	<i>Std. Dev.</i>
<i>Dependent Variable</i>						
depression at II wave	0.220	0.415	0.184	0.388	0.234	0.424
<i>Independent Variable</i>						
age	58.158	5.081	58.691	5.136	57.959	5.048
Austria	0.242	0.429	0.179	0.385	0.271	0.445
Belgium	0.339	0.474	0.462	0.500	0.282	0.451
France	0.065	0.246	0.051	0.221	0.071	0.256
Germany	0.226	0.418	0.205	0.405	0.235	0.425
Switzerland	0.129	0.336	0.103	0.304	0.141	0.349
single	0.207	0.405	0.196	0.398	0.211	0.408
children still living at home	0.146	0.353	0.194	0.396	0.128	0.335
low education	0.310	0.463	0.282	0.450	0.321	0.467
medium education	0.420	0.494	0.402	0.491	0.427	0.495
high education	0.270	0.444	0.316	0.466	0.252	0.435
income	43371.210	43526.650	42348.650	49380.350	43753.970	41140.160
retired	0.290	0.454	0.257	0.438	0.303	0.460
employed	0.463	0.499	0.485	0.500	0.454	0.498
unemployed	0.087	0.282	0.074	0.261	0.092	0.289
home_maker	0.160	0.367	0.184	0.388	0.151	0.359
parental health	0.533	0.499	0.596	0.491	0.509	0.500
< 1 km away from parent's home	0.200	0.400	0.368	0.483	0.138	0.345
between 1 and 25 km away from parent's home	0.463	0.499	0.510	0.501	0.445	0.497
between 25 and 100 km away from parent's home	0.184	0.387	0.098	0.298	0.216	0.411
>100 km away from parent's home	0.144	0.351	0.025	0.155	0.188	0.391
chance of inheritance	37.774	39.575	56.397	39.560	30.803	37.276
depression at I wave	0.206	0.405	0.206	0.405	0.206	0.405
caregiver at I wave	0.386	0.487	0.755	0.431	0.248	0.432
N	1498		408		1090	

Table 2c. Southern Europe

Variable	Full Sample		Informal Care		No Informal Care	
	<i>Mean</i>	<i>Std. Dev.</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Mean</i>	<i>Std. Dev.</i>
<i>Dependent Variable</i>						
depression at II wave	0.297	0.457	0.377	0.485	0.272	0.445
<i>Independent Variable</i>						
age	58.422	5.784	58.438	5.334	58.417	5.917
Greece	0.311	0.463	0.185	0.389	0.350	0.477
Italy	0.355	0.479	0.466	0.499	0.321	0.467
Spain	0.334	0.472	0.349	0.477	0.329	0.470
single	0.178	0.383	0.166	0.372	0.182	0.386
children still living at home	0.257	0.437	0.329	0.471	0.235	0.424
low education	0.691	0.462	0.745	0.436	0.675	0.469
medium education	0.193	0.395	0.171	0.377	0.200	0.400
high education	0.116	0.320	0.084	0.278	0.125	0.331

income	22519.060	20918.810	22645.990	18591.730	22480.160	21588.250
retired	0.213	0.409	0.269	0.444	0.195	0.397
employed	0.279	0.448	0.212	0.409	0.299	0.458
unemployed	0.034	0.182	0.036	0.187	0.034	0.181
home_maker	0.474	0.499	0.483	0.500	0.472	0.499
parental health	0.530	0.499	0.644	0.479	0.495	0.500
< 1 km away from parent's home	0.321	0.467	0.481	0.500	0.272	0.445
between 1 and 25 km away from parent's home	0.335	0.472	0.264	0.442	0.357	0.479
between 25 and 100 km away from parent's home	0.117	0.321	0.053	0.224	0.136	0.343
>100 km away from parent's home	0.155	0.362	0.063	0.242	0.183	0.387
chance of inheritance	17.671	28.491	18.978	30.014	17.270	28.006
depression at I wave	0.368	0.482	0.315	0.465	0.384	0.487
caregiver at I wave	0.267	0.443	0.584	0.493	0.170	0.376
N	1773		416		1357	

Table 3. Average treatment effect on the treated(ATT)- informal care

	Kernel Matching		Radius Matching	
	ATT	S.E.	ATT	S.E.
North	-0.028	0.029	-0.026	0.028
Centre	0.016	0.032	0.011	0.033
South	0.079**	0.032	0.078**	0.032

The ATT figures were obtained using Kernel and Radius matching techniques (with caliper 0.05). A restriction was applied to the common support by excluding observations whose propensity scores were either above the maximum or below the minimum propensity scores of the combined controls.***, **, *: respectively indicate a significance level of 1, 5, and 10% .

Table 4. Average treatment effect on the treated (ATT)- intensive care (personal care)

	Kernel Matching		Radius Matching	
	ATT	S.E.	ATT	S.E.
North	0.003	0.057	0.004	0.046
Centre	-0.035	0.047	-0.061	0.049

South	0.098***	0.035	0.094***	0.035
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The ATT figures were obtained using Kernel and Radius matching techniques (with caliper 0.05). A restriction was applied to the common support by excluding observations whose propensity scores were either above the maximum or below the minimum propensity scores of the combined controls.***, **, *: respectively indicate a significance level of 1, 5, a and 10% .

Table 5. Average treatment effect on the treated (ATT)- intensive care (> 20 hours of caregiving)

	Kernel Matching		Radius Matching	
	ATT	S.E.	ATT	S.E.
North	0.032	0.061	0.004	0.056
Centre	-0.099	0.061	-0.086	0.063
South	0.11**	0.035	0.106**	0.035

The ATT figures were obtained using Kernel and Radius matching techniques (with caliper 0.05). A restriction was applied to the common support by excluding observations whose propensity scores were either above the maximum or below the minimum propensity scores of the combined controls.***, **, *: respectively indicate a significance level of 1, 5, a and 10% .